Trip of 1909.
Pittsburg, Cincinnati
St. Louis, Chicago.

doc. 95

Had 223
Dalty, Richmond and Potter
Palmer at Chicago.

doc. 95

Charles Schuchert
Yale University
New Haven
Conn.

~~3066~~ ~~Sept. 9, 1909~~

[~~See next p.~~]

coll. Sep. 17-18 3062

One basket from Cincinnati Sep. 20 a 21 - 1909

Sep. 21. One small box by Exp. (American) from Fulton Mo.

coll. Sep. 23-25 3065

3066 coll. sept. 10 Greenbrier at Bolivar

8015 coll sep. 16 Ivor, Ky

Feb. 7	[illegible] to [illegible]	1.50
" 8	[illegible] to Pittsburg	10.00
" 8	Pulman to Pittsburg	2.00
" 10	Pitts. to [illegible] & return	2.70
" 11	Pitts. to Cincinnati & [illegible]	8.65
" 16	Cinti to Ivor Ky & Ret.	1.25
" 17	" " [illegible] and Ret	2.50
" 20	" " [illegible]	8.00
" 20	[illegible]	1.50
" 21	[illegible] to [illegible]	.75
" 22	" to Fulton Mo	3.41
" 24	Fulton to Jefferson City	1.16
" 24	Jefferson City to St. Louis	3.72
" 25	St. Louis [illegible] Sleeper & Ret.	.85
" 26	St. Louis to Chicago	3.32
" 27	Champaign to Chicago	2.32
" 27	Chicago to [illegible]	30.00

[illegible]. Film. I.

1. Failure
2. Tenth st, [illegible] section. [illegible] unconformity
3. " " " " " " " "
   Near [illegible] of [illegible] Pittsburg.
4. Coal seam with [illegible]
   Coal 18 inches. [illegible] Ave & [illegible] st Allist.
5 } Channel cutting [illegible]
6 } See [illegible] drawings.
7. Cut out [illegible] Intersection at little
   [illegible] seam [illegible] unconformity [illegible]
   description [illegible].
8 } Adjacent views [illegible].
9 }
10. Thrust fault [illegible] cut [illegible] Devonic
11. Contact between [illegible] as Pocono. [illegible]
    conglomerate [illegible] 1 inch.
12. The contact between the [illegible]
    Pottsville [illegible].

Film. II.

1. Ivor. [illegible] rocks [illegible] view [illegible]
2. " [illegible] East end [illegible] more
   [illegible].
3. Ivor. Some [illegible]

The view brings out well the crenulated layer.
4. Near view of 2nd to show detail of wave layer. Wave near 12 inches. To the left the bottom is flat, to the right very wavy for 7 to 8 feet.
5 West quarry (very wet) east. Face view.
6 Same " " " Face view of entire quarry from E. looking West. The base of Utica is the heavy projecting layer a little above the water.
7. West end of same quarry showing Ramiss [illegible] bed.
8-10. Same within 12 feet.
11. Intraformational conglomerate in first quarry north of [illegible] This is the wavy layer [illegible] showing in detail. [illegible]
12 [illegible] from [illegible] Morrow O. Brat [illegible] Cincinnati.

Film III

1 Elk Horn Falls, Richmond. A [illegible] spoilt [illegible].
2 Spoilt.
3 General view of Elk Horn Falls. Clinton in foreground
4 Another view from below the Falls.
5 The contact of the Clinton and Richmond Close view in a dark place. [illegible] exp. 1/8 stop.
6-8 - Three views of the actual unclipped contact a few hundred feet further down the creek from the mill

9–10 View East of [illegible] Richmond. Upper third
Ct. lenticular [illegible], Streptelasma beds below.
[illegible] blue, [illegible] limestone and [illegible].
11–12 Views of [illegible] Falls. 9:30 AM.

Film IV

1 Crazy Head shale Fault and [illegible]

2 " " " failure
3 " " " another fault.
4 " " " general view of [illegible] at [illegible] Farm
See section.
5 Contact between Devonian [illegible] and [illegible] on Crazy Head Creek. [illegible] for [illegible]
Farm.
6 Jefferson City dolomite with white [illegible]
dispersion
7 Same with chert dispersion. (Black chert and some white with)
drafting
8–12 Across the [illegible]
[illegible] the [illegible] of Callaway Co and [illegible]
the [illegible] to the river bridge.

September 7 - 1909 Tuesday.

Left New Haven at noon for New York. Delivered to Torrey my manuscript on North American Paleogeography.

Later saw a little of Matthew and more of Hermann. In the evening had a long chat with Doctor Clarke of Washington.

Wrote letters to Ulrich, Weston [illegible] and Twitchell.

September 8 - 1909. Wednesday

Started via the P. R. R. for Pittsburg at 7.55 A.M. Fine morning and a fine day ahead.

Pass in great cement works east of Birmingham about 12 minutes. There is more east of Tyrone. Medina at the latter place.

Arrived at Pittsburg at 6.52 P.M. Smoky dark. Stopping at Seventh Ave Hotel.

Fort Pitt Hotel is close by the Seventh Ave and is a far better house.

Sep. 9-1909. Thursday.

Very smoky day.

Called on Raymond at 9.30 and talked over the Canadian situation.

He then began to show me his Pennsylvanic collections made about Pittsburg. He has fine and long series of marine fossils from the Pottsville to 50 feet above the [illegible] limestone. Even marine fossils can be traced into the coal beds. There are Aviculopecten and Orbiculoidea. Also has the Chester fauna within 50 miles of Pittsburg. In a general way it can be said that the marine fossils drop out going east of Pittsburg.

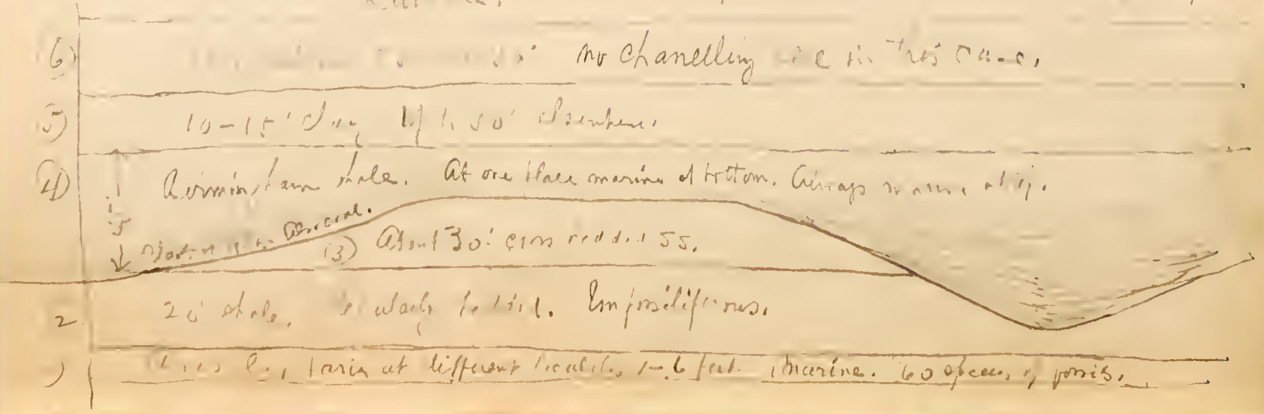
Will send me a collection of the common Pennsylvanic species.

After the regular marine horizons drop out there still occur calcareous zones with minute fossils. These are ostracods, small gastropods said to be Pupa-like and small things that may be minute crabs. In shale layers associated with marine zones are the so-called fresh-water shells and ostracods.

Came this afternoon as one ground to see the actual occurrence.

From Tenth Street Bridge on Monongahela. Just out from center of Pittsburg. Conemaugh Series.

It would seem that 1, 2, 3 are a continuous sequence from marine into river borne micaceous sandstone, then a land period when channels were worn down through (3) into (2). The sea again came in and laid down the Birmingham shale without marine life in some places tho' is present at the top. It filled in the hollows quickly and [illegible] was a flat bottomed sea running again into river borne micaceous sandstone. At one time [illegible] 2 or more such sequences but became [illegible] and [illegible] sequence.



On Wood[illegible] Ave and Dean Street
in Allegheny, Pa.

On a corner city lot saw a small coal seam 18 [illegible] above which came in an impure limestone with Productus semireticulatus. This must be a [illegible] of Co. There is no transition here, for specimens above the coal in the Ames li. may be had Anthracosia planoconvexa and Chonetes granulifera. The coal is slightly [illegible] as if channeled but it is not [illegible] as I have [illegible] depression [illegible] are [illegible] than three [illegible] inches and usually [illegible] one inch. However the coal was [illegible] the Ames li. is continuous in deposition with or came in directly upon the coal!

[illegible] the coal in the "structureless [illegible]" [illegible] above by [illegible] underclay which is stratified varying [illegible] a few inches [illegible] 12 inches [illegible]. From the [illegible] the coal there is a [illegible] transition [illegible] the coal and finally all is [illegible] stratified coal [illegible] 18 inches thickness.

Woods Run section, Allegheny. [illegible] [illegible] fullicker section. Here the [illegible] or Buffalo sandstone rests irregularly on the under [illegible] [illegible] shale. [illegible] at one end of the section there is about 10 [illegible] above the Buffalo sandstone [illegible] followed by the [illegible] limestone. This is [illegible] less than 2 feet thick. Then comes in another sandstone here called "Cow Run" On the right

Road. Musa [illegible] and Griffith Road. Allegheny.

[illegible] cuts out [illegible] the [illegible] below — decided 2 feet limestone. a dyke with the [illegible] of [illegible] sand.

First [illegible] a very irregular [illegible] with fossils 2 feet. In less than 300 feet it is not a [illegible] yellowish 6" marine

[illegible] 5" Very irregular in thickness along a face of 300 feet.

[illegible] shale 12 to 18" Shows bedding. No fossils.

[illegible] has fossils. Fractures on weathering in a irregular

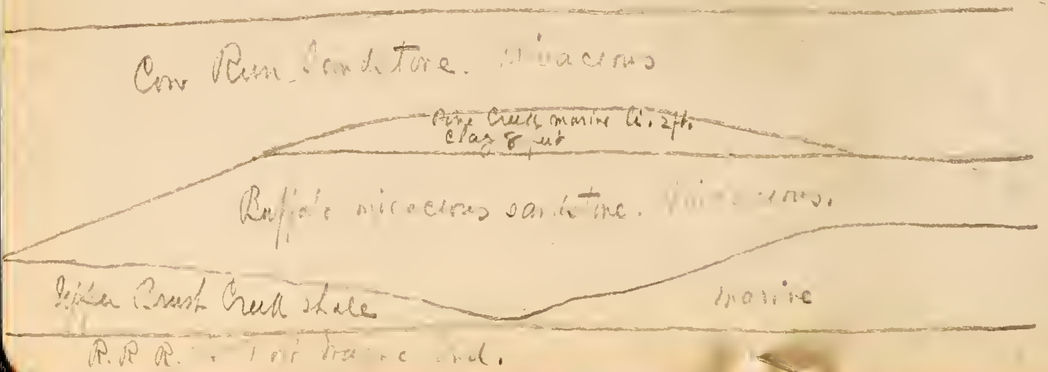
Structure [illegible] wave [illegible] 5 feet. may diagonally, giving the impression of folded strata when seen at a distance.

[illegible] bedding. Has many irregularly placed [illegible] ? concretions

The [illegible] ground shale [illegible] sandstone Top of Buffalo sandstone

the clay at Pine Creek ls. are worked out. Therefore the two sandstones represent erosions over a land and in each case the strata above of marine ...

Woods Run Section. From memory.
See Raymond's drawing made to scale.
Two cycles of marine deposits and continental deposits, each of which is followed by erosion cycles that in turn end in river form sandstone (fine grained), more a shaly then bedded sandstone.
On the Buffalo the clay comes in suddenly.



So far I seem to see a couple or rather a combined sea depositing a thick series of irregularly bedded strata. There are often more decidedly positions near the top. Under normal conditions these seem to go into the structureless clay (without sort or fossils or bedding) and then are underlying formed a fire clay followed by coal. This is followed by land conditions, stream action that at first is degrading cutting out channels, and then aggrading covering over not only the channels but also the marine beds.

This is the condition in some cases but in others the section does not end in coal, a the sandstone or [illegible] is followed by the structureless clay. In other words in some cases the complete cycle does not take place but the marine invasions [illegible] follow one another at irregular intervals.

To work out this matter the [illegible] area needs to be studied in the light of cycles of marine invasions followed by the shallow seas that in turn [illegible] into structureless clay, underclay and coal etc.

the sea is pushed or is drawn away, the topography is slightly rejuvenated, streams become active and channel the great sea flats. The sea again invades, the streams unload on the uneven ground their load, of sand and the marine deposits may come to lay over all or the sea only part before the cycle is completed. In the latter case the sandstone may again be channeled or go over into structureless clay and coral deposits. Each cycle would be different in its intensity and thus greatly vary the depositional succession.

[illegible] says he has seen no fossils nor roots in the yellowish structureless clay. It has many small concretions, there is much slickensides on a small scale and diagonal parting. The latter is only seen on weathered surfaces, and is probably due to creeping causing a false appearance of folding.

In West Virginia marine fossils occur in the coal but there immediately above the

The coal in the [illegible] always
[illegible] the structureless clay but
in the [illegible] there [illegible]
The coal is [illegible] and section is very
decidedly weathered, the layers [illegible]
[illegible] orange [illegible] The
[illegible] on the coal
but below the sequence is [illegible] from the
underclay to the coal. The coal appears
in little lenses [illegible] thick and
about two inches long in the clay. The ap-
pearance of the coal is that of [illegible]
[illegible] for we see no leaves
or plant remains [illegible] as such [illegible]
[illegible] we know that
undisturbed [illegible] are often found
in coal, [illegible]
[illegible] greater gravity [illegible]
pressure into the [illegible]

The sandstones are here rather coarse [illegible]
[illegible] recognize the sand grains [illegible]
layers. Otherwise the material [illegible] fine and
weathers down into thin layers [illegible]

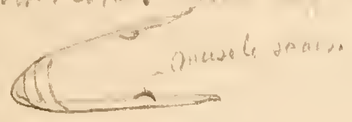
annulus or more. In the weather the sandstones are a light yellowish but often are a very light green. Plants are scarce here and Raymond says are always scarce in the Pittsburg area. Of insect wings he has but three.

From a first view of his collections this morning I think that good faunas can be determined and in certain cases, some species are diagnostic of restricted [illegible].

The Nautiloids are invariably crushed almost beyond recognition. These shells must have remained hollow and broke down with the pressure of the mud. As so little calcareous matter was present none could recrystallize within the chambers.

Of Chitons he has two species.

What is the generic name of [illegible] Orthoceras [illegible]



Leia occurs in the [illegible].

The limestones are more reliable field guides than the sandstones. These however are usually

nodular, rarely heavy bedded solid limestones. These are limestones because of the abundance of fossils in them. The fossils are [illegible] very abundant in the marine shales, Chonetes and Ambocoelia are often crowded together but there is too much argillaceous matter to allow of true limestone formation as a rule.

[illegible] so far as [illegible] where the [illegible] [illegible] [illegible] [illegible] and Philadelphia.

Raymond says he no marine fossils hereabouts at the base of the coal, then [illegible] always at the top of the coal. Therefore the sea invades over the land and the coal swamps. Coals form on the land above shales as a rule but small patches are also seen in sandstone hollows, i.e. [illegible] sandstones. How many such land surfaces there may be is almost impossible to say.

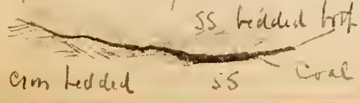
Sept 10-1909 Friday

Started east on the P. R.R. at Blairsville Intersection. At 7.10 A.M. then walked east to Bollivar.

In the first cut east of the Intersection one sees a coal about 2 feet thick followed abruptly above by dark shales about 15 feet thick and then a thick series of sandstones. The coal rests on a greenish shale and comes in suddenly. This coal is   in the Allegheny series. Dip to westward.

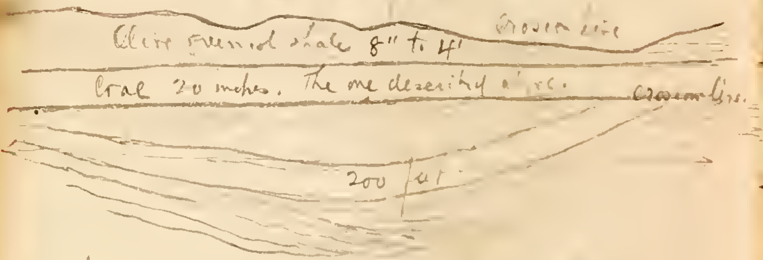
In the east end of this cut one gets a fine view of the upper Pottsville followed by the Lower Kittanning coal. First there is a thick series of greenish sandstone passing gradually into shales that are olive colored. These may be 20 feet thick followed suddenly by the coal about 3 feet thick. Beneath the coal is the yellow clay, [illegible] a sample, that is about 1/2 to 1 1/2 inch thick. Above the coal stops as suddenly but here the shales are very dark green to bituminous. The coal is not throughout clear as there are [illegible] and streaks in it.

In the sandstone here there is a hollow and at the base of the hollow is very impure coal. Thus



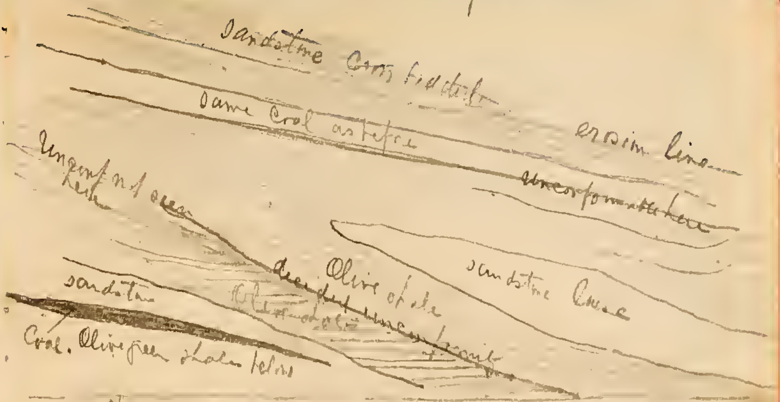
Across one coal seam seen of the Pottsville about 20 inches thick has many minute [illegible] layers of slaty coal that stand out on the weathered surface running across the [illegible] normal appearance and [illegible] inspecting the top while charging [illegible] has about one inch of [illegible] shale and then the olive green shale. Below the coal also comes in suddenly but at irregular intervals [illegible] one seed streaks of coal. The greenish shale above the coal is about 8" to 4' feet thick with layers of [illegible] and conchoidally fractured concretions. Then a mass of coarse sandstone.

from here Pottsville [illegible] coarse sandstone.



The coal rests on [illegible] like a seam as [illegible] [illegible] Farther [illegible] almost [illegible] the coal

Base of Pottsville.



I have taken two views of it. Film I, 8-9.
The above is in the base of the Pottsville.

The Pottsville here is about 150 feet thick, followed below by the Mauch Chunk. The latter is here about 100 feet thick. The [illegible] lower Mauch Chunk. There the "Royal Banner" [illegible] "Conestoga" a sandstone 420' [illegible] [illegible] a concretions. Otherwise it has a rotten character. This is that of the Pocono several hundred feet thick.

The Pocono here must be over 500 feet thick and consists almost exclusively of sandstones (micaceous). These are much cross bedded but appear to be more regularly bedded than the Pottsville. The shale zones are then rarely over 10 feet thick and more often only a few feet. The sands [illegible] appear to be [illegible] more [illegible] than those of the Pottsville, and

more uniform in character.

Below the Pocono at least 300 feet of grey sandy shales and sandstones may be seen and most of grit. The common one is *Spirifer disjunctus*. There are others of *Rhynchonella* and bivalves. It is probable that these beds are [illegible] if not then Chemung.

In the apex of the fold are at least 2 overthrust faults, the eastern side [illegible] over the underlying or western mass. Have a picture of one.

The Pocono rests on an erosion unconformity [illegible] the ? Red [illegible]. This is plainly seen and is [illegible], [illegible] I-11. The basal Pocono is decidedly coarse sandstone with many rounded quartz pebbles up to one inch or even more.

The basal Pocono [illegible] sandstone at the top of the Pocono passes into more irregular and softer sandstone and then into a red shale zone of about 10 feet. Therefore the passage from the Pocono into the Mauch Chunk seems to be continuous. Over the red shale [illegible] a sandstone of 15 feet thickness [illegible] decidedly cross bedded, followed by bluish shale with [illegible] of the Green-

DOCUMENT NO. 95
Invertebrate Paleontology
Yale Peabody Museum

The Greenbrier fossils referred to came from Sang Run, Garrett Co., along the Youghiogheny Riv., below Swallow Falls. Also from another horizon near the top of Winding ridge, between Accident and Friendsville. Fossils are abundant at both these points.

3066

Sincerely yours
Geo. M. Pepden

Letter

Frank Hartley
North Mehoopany
Pa

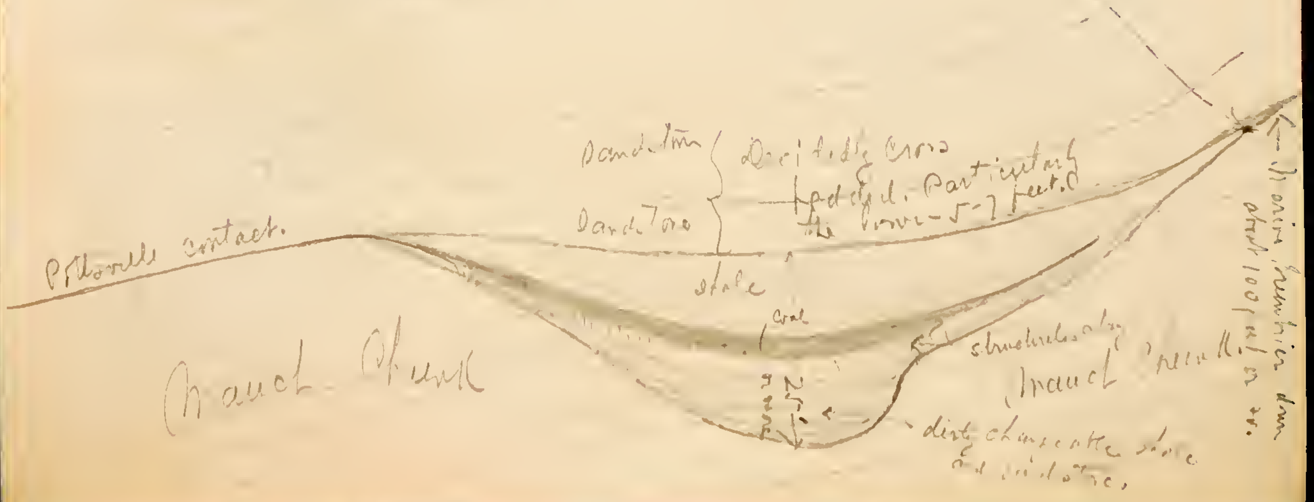
brier fauna. These shales may be 15 feet thick followed by more shales interbedded with Red shales for fully 60 feet more before the Pottsville comes in. Therefore the Greenbrier is here in the lower Mauch Chunk. It abounds in genuine Chester fossils as *Seminula subquadrata*, *Spirifer leidyi*, *Productus chesterensis*, etc.

In the Greenbrier zone are also red beds abounding in bivalves of many species and *Ostracoidea*. Therefore these red-beds are marine but those below and above identical in color have no fossils. It seems to me that much if not all of the Mauch Chunk is here marine. It is a cycle of deposition like the marine ones of the Pennsylvanic beginning with marine deposit and ending in a filled sea and continental deposit.

At the eastern end of this cut about one mile west of Sullivan may be seen a fine example of erosional unconformity of the lower Pottsville on the Mauch Chunk. The sketch of it is on the next page and a photo (Film 1-12).

Section just west of Rollivar (in turn)
Showing erosion [illegible] of the lower Pottsville
on the Mauch Chunk.

Farther west more coal (impure), on the old surface



Sep. 11th 1937. Saturday.

(2) Pagnolly Old Cald. collection. Above Pentremz

✓ Cuttids crowwell. Fine specimens new.
✓ Eumetria vera (small specimens) One sh.
✓ Productus chesterensis type (narrow, highly arched).
✓ Seminula subquadrata
✓ Peirthyris orbicularis accli Pagnolly Cin
✓ Dielasma structure ... smaller. ...
✓ Spirifer large of bigrimaei type but smaller. Have one.
✓ Spiriferina ... Fine large and common
✓ Spiri... arcymontana ?
✓ Productus ...
✓ Girtyella multattenuata,
✓ "Faroslla diverpens". ... and
convex diaphragms. A ... with
small ... Also another of with ... 5/8 in dia.
Schuchertella, ... media ... sized ...
... ... fine ...

✓ "Pugnax ... montana" looks ... like a
... ... bottom ...
of the ... spines are ...
... ... 1 inch or more ... angular
... ... Is this outgrowth of
S. spinosa

fauna.

(1) Old Baldy Pentremite fauna. [illegible]

✓ Pentremites [illegible] large, [illegible] form

✓ [illegible] small and [illegible].

✓ Dielasma turgida [illegible] common.

✓ [illegible]

✓ [illegible] common.

✓ [illegible], small, [illegible] Common

✓ Eumetria verneuiliana. Rare !

Found some miles away from [illegible]

Old Baldy, etc. some miles away from the [illegible]

(3) [illegible] above the [illegible],

[illegible] (large over one inch).

• Productus semireticulatus

[illegible]

[illegible] large [illegible]

Pieces of [illegible] as large as eggs.

[illegible]

Productus small [illegible] and more convex.

(4) [illegible]

Productus costatus, P. semireticulatus, [illegible]

(common) [illegible]

3, [illegible] looks like the [illegible] among [illegible] species.

Another locality above [illegible] zone and beneath Lipteri zone.

Marg. note: Have me

{Spiriferina shape like granulifera but plicate like
(striata. common. Is it S. marcoui? See other lit. (1st).

Cup corals 4 inches across cup and 6 inches long.

Productus cora [illegible] and [illegible].

P. semireticulatus var.?

P. elegans [illegible] but more like [illegible]

P. sinuated forms.

Spirifer [illegible] [illegible]

Spiriferina spinosa?

Seminula subquadrata

Devonic

The Three Forks faunas have throughout Athyris disjunctus ([illegible] var. with high flat area) and the variety larger and rounder with small and fine striae over the entire [illegible] that I once identified as var. Athyris [illegible]. Certainly the same occurs up in British Columbia that I identified last week on the Canadian survey. The entire Three Forks [illegible] 130 feet thick but [illegible] the highest 30 [illegible] [illegible] the [illegible] Devonic fauna. [illegible] [illegible] [illegible] [illegible] in [illegible] the lowermost

fossiliferous beds. At the very top occurs a very different fauna in a different stuff with [illegible] [illegible] Spirifer [illegible]itus.
Therefore it is clear that there is a [illegible] break here between the [illegible] and Medina limestone. Admitting that the Devonic sea must be [illegible] [illegible] [illegible] [illegible] [illegible] board. The Medina probably does not begin until the earliest Helderberg and [illegible] [illegible] [illegible] not [illegible] at all.

Raymond's
Home at Brighton Heights, [illegible]

Raymond [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Pattern [illegible] [illegible] in the [illegible] [illegible].

The Stevensons [illegible] [illegible] [illegible], [illegible] a [illegible] list [illegible] [illegible] species from the Pittsburg [illegible] western Pa. area.

Raymond will make for me [illegible] [illegible] slides [illegible] [illegible] [illegible] [illegible] [illegible] to [illegible] [illegible] much from this.

Raymond has a <u>Tohrenaster</u>? from the Madison limestone.

Leiorhynchus and Pugnax rockymontana particularly characteristic of Cordilleran Upper Devonic and Mississippic.

The Dinohyus (Entelodon) skeleton is the most impressive of mammal mounts here. The head appears entirely too large for the animal. The neck vertebrae do not suggest the necessary strength to hold the head up in the flesh restoration. A finer skull than ~~this~~ one is owned by Barbour.

Two camel skeletons on slab on exhibition. One is very young but a few months old. Both are perfect skeletons and the older one even preserves the cartilage ribs. This year Peterson has found ten other entire skeletons of these camels.

The incisor teeth of Dinohyus has wear grooves at their base. Peterson thinks these are due to rooting.

Of Adelton [illegible] Peterson
on [illegible] 40.

Left Pittsburg on P. R. R. at 9.50 pm [illegible] Cincinnati.

Oct. 12 – 1909 Tuesday
Arrived at 6.30 a.m.
At [illegible] house, had a [illegible] auto-mobile ride. Saw Philip, [illegible], [illegible] and Emma.

Oct. 13 – 1909 Wednesday.
Spent the morning [illegible] at [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible].

Oct. 14 – 1909 Thursday.
Wrote letters [illegible] [illegible]
Visited [illegible] in the morning

start 8015

Sep. 15 - 1909 Wednesday.

Came down to the city with [illegible] in the morning. Then visited Eden Garden, the Art Museum and Fort Thomas.

Visited Phil in the evening.

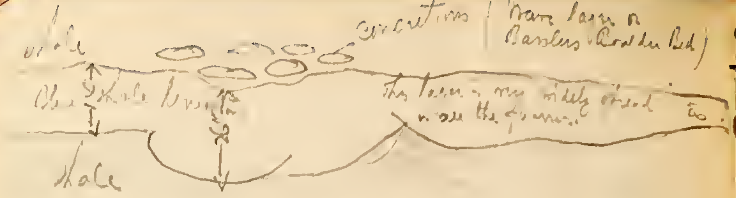
Ante: R.R. 3 m. E. of Ivor. C.&O. R.

Sep. 16 - 1909 Thursday. Ivor. C.&O.

At 7:30 A.M. started for Ivor.

In the first quarry a few hundred feet east of Ivor may be seen the crinoidal layer (of Ludlow) with the other [illegible] quarry noted above. The crinoidal layer is here not rolling but has the usual thickness of about one foot, the surface of which has here in places an edgewise conglomerate surface. On this surface occur the large branching Ptilodictya and from the shale above this layer of Heterocrinus stems. Zygospira is also common. These layers are near the top of the quarry and stick out considerably. They therefore show well in the [illegible] picture (Later this is the base of the Utica).

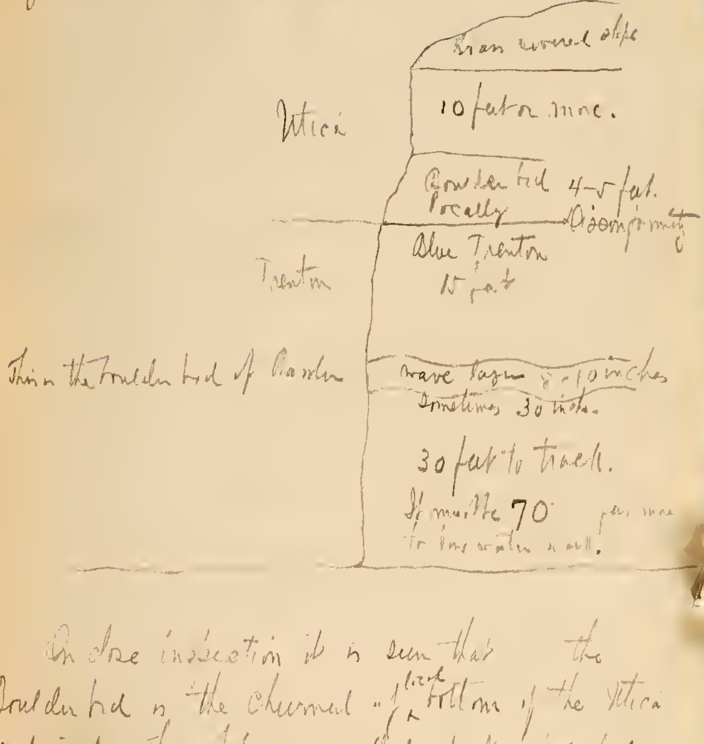
The [illegible] layer photographed is about 15 feet beneath the crinoidal layer resting on shale (blue). The limestone bed above the shale is near 2 feet thick but sometimes [illegible] down to [illegible] to a bed 6 to 8 inches thick. The bottom of the layer is thus



[illegible] [illegible] east [illegible] [illegible] [illegible]
and much larger quarry. At the west end of this quarry
may be seen the "boulder beds" of [illegible] at the base
of the Utica. The beds below are [illegible] [illegible] [illegible]
[illegible] blue limestone with [illegible] [illegible] shale
partings. The top of these beds had been eroded flat
but not exactly so for the contact with the Utica shows
slight broad irregularities. The Utica weathers a much
lighter color a grayish-yellow. [illegible] [illegible] [illegible] [illegible] for
150 feet one sees a much churned up series of
[illegible] and shales from 4 to 5 feet [illegible] [illegible] [illegible] the
Utica follows [illegible] as is [illegible] [illegible] [illegible] Concre-
tion series. Elsewhere in this quarry [illegible] [illegible] [illegible]
[illegible] [illegible] one sees no more of these boulder beds
but the Utica contact is level [illegible] [illegible] the blue [illegible]
beds [illegible] [illegible] [illegible] [illegible] [illegible] limestone.

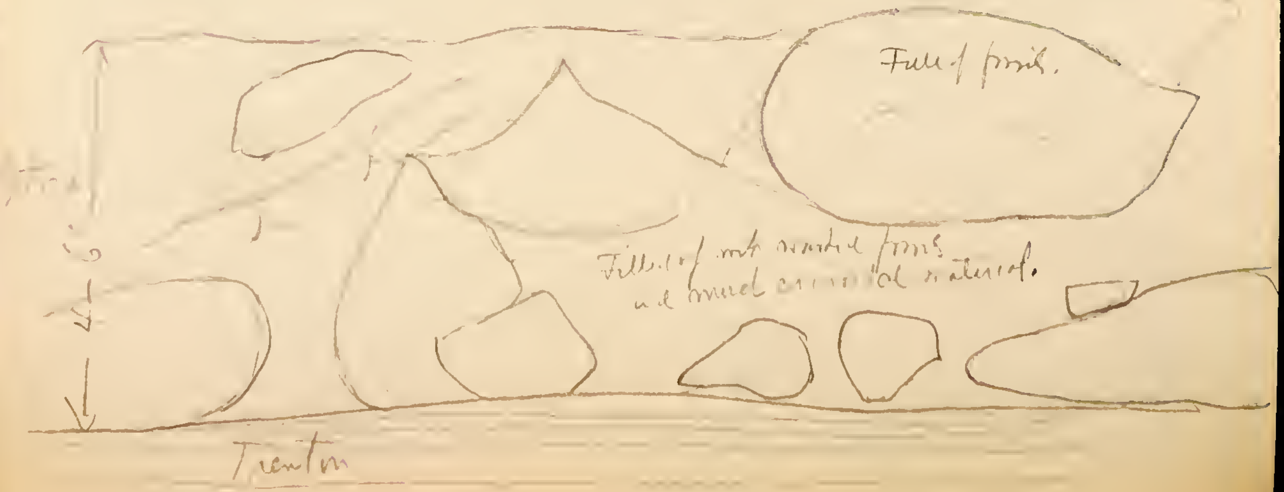
~~[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]~~
[illegible] equivalent [illegible] boulder [illegible] [illegible] [illegible]
[illegible] one 15 feet in width. [illegible] [illegible] [illegible] [illegible] [illegible]
Therefore the [illegible] [illegible] [illegible] in 15' beneath the
Utica contact, the [illegible] [illegible] [illegible] [illegible] [illegible]

Ledge. The section is thus



On close inspection it is seen that the Boulder bed is the channeled or last bottom of the Utica sediment. The whole was rolled about, up ended and many of the mud rocks rounded and then all packed together. The contact with the blue Trenton is very sharp, the lower Trenton is smooth, even bedded, blue-mud limestone, while the Utica begins reddish-grey, granular with considerable crinoid material. Viewing the boulder bed 50 feet away one sees this:-

Iron bg. Lorraine Utica beds on Trenton



A few hundred feet west of Ivor may be seen intraformational conglomerates, one the, time in the Trenton about 35 feet beneath the Utica. It is nothing more or less than a churning of the sea bottom.

These seem at two levels. There are two in this part of the Trenton besides the wave, larger or boulder bed, of the Utica.

The "boulder bed" shows well in the first quarry to the rear of the Ivor station. I have photographed it. It lies in the centre of the picture and is away at one especially but in places the whole bed is churned. The thickness varies from one foot to about 30 inches. The picture taken in the thicker part.

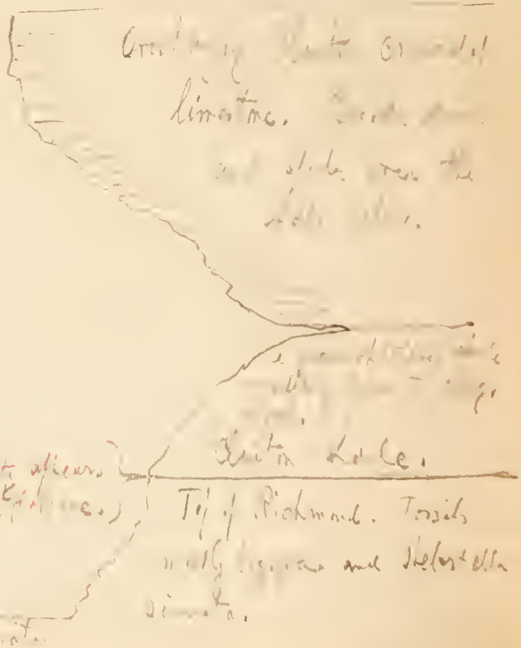
The same layer is again in the next western quarry. But the Utica shows no more churned bottoms.

The chief fossils of the Trenton are the brachiopods. Of brachiopods one sees big Dalmanella testudinaria, Plectambonites sericea, Rafinesquina alternata and Leptaena recurvirostra. Pelecypods large and are everywhere and rarely one of Calymene. Crinoidea also are common.

8015 end

The hills [illegible] are rather [illegible] rounded, [illegible] [illegible] pointed [illegible] [illegible] with [illegible] and flat topped. There are few side vallies or this [illegible] along the [illegible] valley mostly flat or slightly undulating and [illegible] gullies [illegible] Cretaceous.

Elkhorn Creek [illegible] [illegible] Richmond.



This disconformity appears as a very even [illegible].

start [3062]

Sep. 17 1909. Friday.

Left at 8.30 for Richmond.

Arrived at Richmond at 10.20. At 10.35 started on foot for Elkhorn Falls 4 miles to the south. Got there a little before noon.

The bridge over the creek crosses the Clinton and the falls are less than 500 feet down stream. Took several pictures ane of the Clinton contact.

The Richmond (Cumming's bed 16 of 1.41A.) is very even bedded greenish, sandy and on others reposes the Crinoidal Clinton limestone with pockets of fossils at 2 to 3 feet above its base. The clay bed between is very even here because the Clinton has slid down. The contact is plainly seen because of the very different lithology and the fauna. See ... p. 657. This I afterwards saw was slipped down Clinton.

Less 1/8 mile down the creek from the mill at Elkhorn Falls may be seen the Clinton-Richmond contact, unconformity starting. It is as drawn on the opposite side and of the three I have 3 views.

The top of the Richmond is very ... of a greenish calcareous thin bedded ... that in the weather will completely break down. Has many bryozoa, Hebertella sinuata, H

insculpta?
and Platystrophia lynx-moritura.

Returning to Richmond collected in the cut of the new railroad Chicago, Cincinnati and Louisville. This cut is high in elevation and very near the Clinton, but none of the latter is in place here but pieces are present in the glacial debris. Here one sees the same thing as in the Elkhorn with the addition of Rhynchotrema dentata. There fat lower fossils are not more abundant but are are washed and comminuted by the sea. Dans nr R. fulamellosa here but the big Strophomena filitexta and Leptaena rhomboidalis occurs here. In this horizon also occurs Tetradium. Streptelasma rusticum is very rare and much dwarfed.

On the north branch of Elkhorn Creek, just below the private road to the sand pits occur the Rhynchotrema dentata beds. According to Cummins' section this bed is about 60 feet beneath the Clinton shale.

Put up at the Arlington House.

Sep. 18 Saturday, Richmond Ind.

Got up at 6 A.M. and collected a part of the morning along the West Fork of the Whitewater up to Thistlewaite Falls. The highest beds are the Rhynchotrema dentata beds. Here R. capax is very rare. Below are beds abounding in Streptelasma rusticum with R. capax more common. At Thistlewaite Falls level R. capax in the senile forms are very common. Therefore the development is from the highly convex forms of R. capax to R. dentata, that [illegible] culminating at the very top of the Richmond.

The R. dentata beds are particularly rich in fossils of which [illegible] are [illegible] brachiopods. Brachiopods are apt to be single valves and most of these were dead shells for they are usually [illegible] [illegible] are [illegible] [illegible] are [illegible] [illegible] are [illegible] dead to grow upon. The commonest shell of these beds is R. dentata. [illegible] is very rare. Gastropods and bivalves are always present but the specimens are too poor to take along.

end [3062]

[illegible] seem [illegible]
[illegible] a day [illegible] selected [illegible]
[illegible] [illegible] [illegible] [illegible]
[illegible]. These [illegible] [illegible] [illegible]
[illegible] in the basal [illegible]
[illegible] [illegible] specimen [illegible]. [illegible]
[illegible] these [illegible] [illegible] and
[illegible] true [illegible]. The latter
[illegible] never erect [illegible]
[illegible].

[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] are [illegible]
[illegible] 6. [illegible]
[illegible]
[illegible].

[illegible] [illegible] [illegible]
[illegible].

[illegible]

[illegible] Sunday
[illegible] at [illegible].
[illegible] afternoon [illegible] [illegible].

Sep. 20th. Monday.
Left Cincinnati over the B. & O. S.W.
at 12.30 P.M. for St. Louis.
Arrived here at 9.15 P.M.

Sep. 21st. Tuesday. St. Louis
Started out this morning at 7.30 for Kimmswick 20 miles south of St. Louis, on the St. Louis, Iron Mountain and Southern R.R.
To the north of the town beside the railway is an abandoned smelter and here may be seen quarries in the Kimmswick limestone. The rock is coarsely crystalline limestone replete with crinoidal forms among which the Bryozoa are most conspicuous and crinoidal material. Considerable secondary alteration has taken place originally on the sure [illegible] filled with calcite. When the engine [illegible] limestone is porous due to [illegible] crystals.
The strata dip to the north-east 10 to 15 degrees. Less than 1/8 mile north along the track is a high cliff of cherty more or less dense, [illegible] limestone that I take to be basal Mississippian. As it is raining I can make no effort to find here the Fernvale.

[illegible] and [illegible] did not [illegible] walk [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] The [illegible] [illegible] near [illegible] in this direction.

[illegible] 1900 [illegible]

Left [illegible] [illegible] in Fulton, [illegible] [illegible] road [illegible] [illegible] [illegible] on the [illegible] Fulton [illegible].

[illegible] claims to have [illegible] [illegible] on which [illegible] 2600 [illegible]. From all [illegible] and a fine [illegible] "the best [illegible] [illegible] side of any [illegible]" [illegible] [illegible] very much.

[illegible] [illegible] [illegible]

start [3065]

Sep 23-1909 Thursday. Fulton Mo.

Started out at 6.30 with Greger and a team. Drove south to the Izyder farm on Craighead Creek for Stropheodonta. The section here is as follows.

Upper Craighead shale, 20 feet but here not more 10' can be seen.

Crinoidal limestone. A hardened shale. About 2 feet.

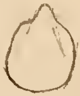
Lower Craighead shale

30" — Zone of Stropheodonta (1)

30" — Zone of Stropheodonta (2)

2' — Zone of Stropheodonta (3) 2 feet thick.

Zone of Stropheodonta (4) seen long
are not seen here.

Zone (1). Just below so called crinoidal limestone. Here the shells are packed together. These are the largest and most accurate fellows. 

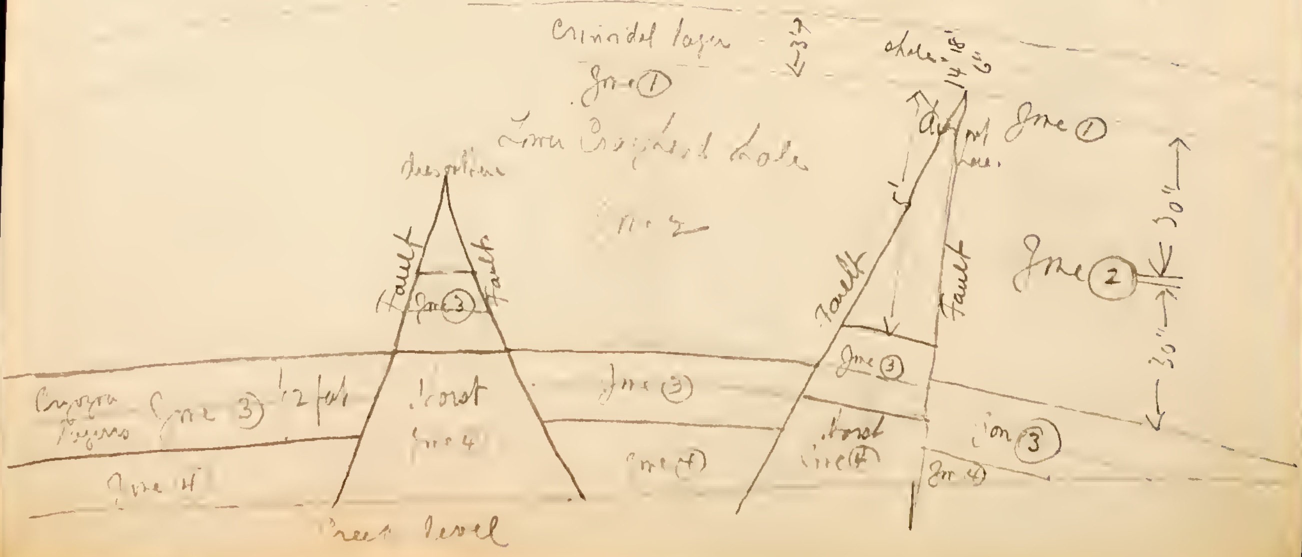
Zone (2) Many shells packed together: Much like those in 1).

Zone 3) This is the Bryozoa layer (also Strophalosia and Chonetes) of about 2 feet thick near the center of which the Bryozoa are most

a slight arch.

Structure, [illegible] [illegible], south of Fulton, Mo. 6 miles in a [illegible] line north.

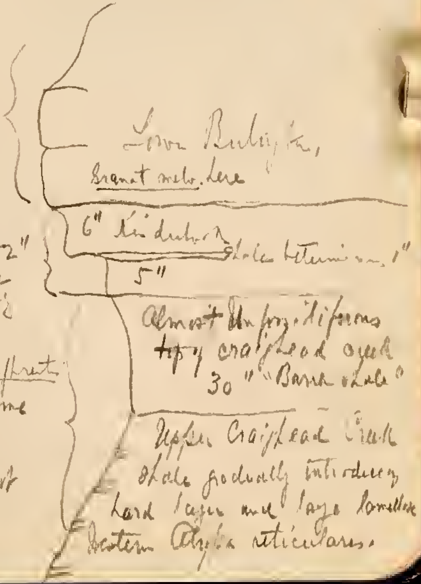
Upper Craighead Shale, to surface slope.



Common. I would not be surprised if the originally some attached to the Bryozoa which may have been the cause [of] the flattening of the shells. Here also occur the largest shells and the humping appears to be decided here.

Zone (4) Crinoid surface. Here the Strophodontas are rare and flatter. Below this level I am told the shells are all flat and some semicircular like.

Just a little up the same creek may be seen the contact between Devonian and Kinderhook



Kinderhook. Gregor says these Cores of the [illegible] as Gaffret's idea. Thinks may be the same as Lithographic limestone. Probably not but rather the last of the Kinderhook.

Then saw the lower Gray Head shale on the Davidson farm 1/2 mile south west of Ogden Farm locality. See more below.

About 1/4 mile south of the last place may be seen high bluffs on the Middle River. At the base is the Fort Monroe limestone ... up 75 feet. Apparent break comes in the Callaway limestone, about ... thick followed by the ... shale and then the ... Burlington chert. Could get no picture.

Rec ... owens formation comes ... miles N.E. of Fulton. ... about Fulton, Mo. The former is here only ... meters thick. ... calls it the ... shells ... large. This ... mud ... south ... is.

The ... does not ... Fulton.

The ... material ... from the ... shale ... near the ... the "... shale" as ... the Permic. ... all the ... ...

(the large plano-convex) came from the upper 20 inches just beneath the Rauna layer.

What I have learned in regard to the Strophodonta sequence is this. The history begins in the Callaway limestone. The earliest forms in the Craighead are flat, transverse, coarsely plicate forms. The evolutional tendency among these are towards alation and varying, more convexity and probably a tendency to finer plications. In the Bryozoa beds probably due to attachment to the bryozoa, stromatopora and corals, the hinge shortens, hemipery begins and decided reduction or implantation of new striae. It is here that the angulated large more or less subquadrate forms occur. Striation of the navalis type becomes more and more abundant and continues into the Upper Craighead. The large flat forms (Str. callawayensis) may be an outgrowth of the earlier stock or may be a new migrant.

The whole history of these Strophodontas is revealed in the lower half of the Lower Craighead, i.e. up to and including the Bryozoa bed. Later there is little new development.

The Devonian occurs in the bluffs of the Missouri opposite to Jefferson City.

Edgewood fauna of Pauley mixed with Trenton fossils, so says Greger. Zygospira recurvirostra here belongs Trenton.

The generalized section about Fulton is

Coal Measures. Lower layers have P. [illegible].
(? Chester and St Louis)
(? Keokuk).
Burlington
Very thin Kinderhook ?
[illegible]
Callaway
First Magnesian
Sandstone.

Sep. 24-1909 Friday.

Fulton – Jefferson City, Mo.

Left Fulton at 9:06 A.M. On Jefferson City at 11 A.M.

Just below [illegible] O.E. of the Station one sees the Jefferson City dolomite formation. The section is as follows:–

Whitish dolomite, as a rule thin bedded, in [illegible] li. Most of the beds weathered down but [illegible] somewhat heavy beds

15–18 feet.

White thin bedded [illegible] dolomite.

5 feet.

White evenly bedded dolomite. [illegible] cotton li. 6 feet.

Even contact

Dirty white irregularly bedded dol., in places 8–18" [illegible] formed and conglomerate.

Erosional contact

Conglomerate –

White evenly bedded dolomite.

10 feet

Dirty white heavy bedded dol. with some chert, in beds [illegible] and large concretions. [illegible]

10 feet

[illegible] at base (see note)

All a yellowish-white

Erosion disconformity.

R.R.

The dispersion of the [illegible] rocks may be seen here to good advantage. Sometimes the [illegible] [illegible] [illegible] in thin beds and again often such a thin one has grown from 3/4 to 1 1/4 inch thick it [illegible] [illegible] through settling and so came to look like an intraformational conglomerate. More often concretions [illegible] [illegible], often quite [illegible], and then a [illegible] very irregular concretions with [illegible] [illegible], set in [illegible] [illegible] around the [illegible]. [illegible] [illegible] concretions are [illegible] [illegible] chert [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible], 2 [illegible] [illegible] [illegible].

In other thick beds [illegible] [illegible] [illegible] [illegible] [illegible] more regular are the [illegible] [illegible] in [illegible], [illegible] the [illegible] [illegible] [illegible] dolomite. [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] [illegible] [illegible] [illegible] 2 [illegible] [illegible]. [illegible] [illegible] at 5.20 [illegible].

[illegible] 5 [illegible] seems to [illegible] [illegible] [illegible] [illegible] the [illegible] valley [illegible] [illegible] [illegible] [illegible] [illegible] of the Jefferson City dolomite. Distance across [illegible] [illegible] 2 1/2 miles. [illegible] terrace [illegible] [illegible] [illegible]

Sep. 25 1909. Saturday.

Took the 7:25 A.M. train over Missouri Pacific for Fern Glen. Got off at Valley Park about 2½ miles east of Fern Glen. Between these two places one sees cliffs of whitish limestone with much chert. From the fossils of which I saw almost none I take the horizon to be about Burlington.

At Fern Glen picnic place just west of the flag station there is a little cliff of crinoidal limestone at the track. Ten feet higher comes in a zone of red shale yielding the fossils I collected. These red shales pass into greenish and then yellowish shale that at the top have small geodes. This shale thickness may be 25 feet and is the typical Fern Glen formation. Above in the cliffs probably 75–100 feet higher are much the same as the Burlington.

Going west along the railroad and in front of the Castlewood flag station one sees the Kimmswick that at the top bears considerable chert. Less than ¼ mile west are quarries and a lime kiln in lower beds of the Kimmswick.

Near the top of the Kimmswick saw Platystrophia

end 3065

[illegible]. Plectambonites, [illegible], Rafinesquina, [illegible] Strophomena, and an abundance of Bryozoa, [illegible], [illegible], Crinoids.

[illegible] as we [illegible] near the [illegible]

Pacific we get [illegible] [illegible] of the [illegible] in

[illegible] a Pacific [illegible] a [illegible]

[illegible] and, [illegible] the [illegible],

[illegible] [illegible] are cliffs of Cimarron

that the [illegible] [illegible] to use.

Here in the [illegible] away from [illegible] in

[illegible] case [illegible]. The Meramec [illegible], [illegible]

[illegible] [illegible] Valley [illegible].

[illegible] Hermann one sees a [illegible]

white [illegible] [illegible] [illegible] with [illegible]

[illegible] [illegible] [illegible] at [illegible] [illegible].

Hermann is 24 [illegible] [illegible] [illegible].

doc. 95

Strophodonta layers of Craghead shale as seen by Schuchert with Greger September 23, 1909 on the Synder farm Craghead Creek, about six miles South of Fulton, Missouri. See vol. 17 (1923) Mo. Survey. See A. J. S., vol. (27) 1909 by Greger.

3065

Upper Craghead shales not studied about 8' 6" thick
Some of the Strophodontas continue here, mainly S. callawayensis. Some navalis

Middle Craghead li = Crinoidal layer 1' 8" "

Lower Craghead shales 12' 8"

(margin: Here are the humped forms as extreme, along with S. callawayensis. 36")

Zone (1) 30" Shells most common in highest 6 to 8 inches

Zone (2) 6" Shells again common here (Synder farm)

(margin: Shells now becoming subquadrate and humped along with fine striation. 5 feet. Main zone of evolution)

Zone (3) 24" Bryozoa and coral layer. Strophodonta most abundant here.

Zone (4) ~~at the base of zone 3 24"~~ underlies 12 inches below zone 3 Humped form common (navalis) but do not weather out nicely

Interval of 24" with no shells seen. (Synder farm)

(margin: Coarse striate-ate forms like S. hemphilli along with S. cymbiformis. 5 feet)

Zone (5) Basal layers best seen on Davidson farm 1½ miles S.W. About 5 feet thick

Callaway limestone. The history of these Strophodontas begin in this limestone.

DARLING K. GREGER
FULTON, MISSOURI, U. S. A.

Memoranda

The labeling of species is hard to fix upon. Greger is more correct than me. See my evolution series in exhibition series.

All of Swallows Callaway Co. Devonian fossils came from two localities,— Bellama Springs, and Old Snyder Farm. The first is Callaway limestone and the following forms were described from there Spirifer annae, Athyris fultonensis, Cyrtina missouriensis Cyrtia occidentalis, Swallow labeled A. reticularis Stropheodonta demissa and Stroph. quadrata from Bellama Springs

doc. 95

DARLING K. GREGER
FULTON, MISSOURI, U. S. A.

These were in the State University coll.
before the fire, along with a lot of Corals
of the Callaway limestone, you can feel
safe in using all of the specific terms
for Craghead species excepting *quadrata*
as I remember the species labeled *quadrata*
they were attached to fragments of limestone
and were of the S. *erratica* strain and the
species I call *S. costata* Owen.
There is a remote possibility that Swallow

DARLING K. GREGER
FULTON, MISSOURI, U. S. A.

stumbled on to a specimen of Strophonella crassa Rowley, and if he did undoubtedly it would be a Stropheodonta with him however there is nothing in any of the descriptions that would suggest Strophonella.

Feb. 26 - 1909 Sunday.

Left St Louis at 8.30 A.M. over the Wabash and arrived at Champaign at 1.15 P.M.

Spent the afternoon and evening with T. E. Savage.

The Edgewood occurs near Wilmington Ill as a thin bedded limestone, about 10 feet thick. It has the same fauna as that of the Cape Girardeau area.

The Thebes (Richmond) is also here below which is the Fernvale Richmond. No connection with Cape seen.

The Calhoun Co Devonian is not so thick as that of Callaway Co Iowa and has a different fauna. May this be of a different horizon or are there here other barriers than the Kankakee.

Will send me photos of the Snyder Creek fault, a section of the Devonian above the Lingula and beneath the Kinderhook, and a third showing the Devonian - Kinderhook contact in Calhoun Co.

[illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] from the field [illegible] [illegible] [illegible] [illegible] the Devonian limestone was entered [illegible] [illegible], [illegible] [illegible] [illegible] above [illegible] 1500 feet [illegible]. Total depth [illegible] 1500 feet.

Had lunch at [illegible] with George Bailey, Boggs, Hurton and [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible].

[illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible].

Feb. 28-1905 Tuesday

Spent a part of the morning in the Chicago Acad. of Science in Lincoln Park.

There is a basement over which the entrance stairs land. This first floor has a small central exhibition room, not well lighted, with lecture or similar rooms on each side. In the back of the central room are the stairs and elevator to the main exhibition floor. The plan of this room occupies the entire width, with a second floor gallery. Central [illegible] skylight, cases along [illegible] around the sides.

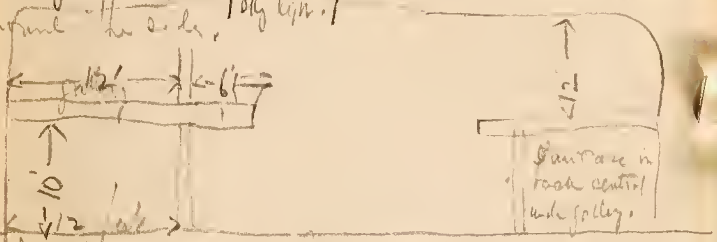


Table of cases about 8'. Window space about 5'. Begins [illegible] floor about 40" [illegible] 1' of ceiling. Height of windows about 6'. [illegible] about [illegible] wide. [illegible] between windows about as wide as windows (Could be made less and or enlarge window space).

Central sky light flat below, arched above [illegible]

[illegible] [illegible]. Light inadequate on account of dark ends. The roof [illegible] [illegible] four way

[illegible] should not be.

In general the [illegible] plan is good. The [illegible] [illegible] but [illegible] [illegible] [illegible] better.

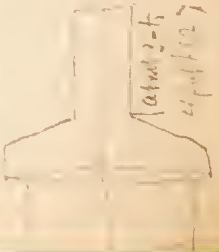
The [illegible] is also built [illegible] the above plan [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] about 12 feet. Space [illegible] wall and [illegible] [illegible] [illegible] 12', inside [illegible] pillars about 5 [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] tops, would be [illegible] square [illegible] [illegible] [illegible] [illegible].

The [illegible] plan [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] readily be added.

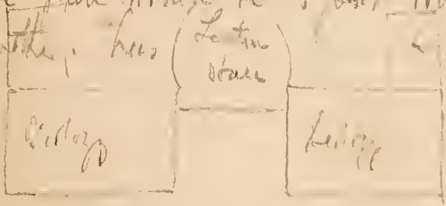
([illegible] came [illegible] [illegible] were about 18". [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

The gallery [illegible] [illegible] [illegible] are [illegible] of [illegible] [illegible] [illegible], [illegible]

should be the [illegible] [illegible] [illegible].



If we copied the Chicago [illegible] I should add for five building like this one, [illegible] to be devoted to Mineralogy, Geology and [illegible], the other for Zoology, Botany and Ethnology. The plan should be to place both [illegible] one another, thus (Lecture stairs) [illegible]



Paleontology

Orthis [illegible] occurs [illegible] at Farmington, Ills.

Brachs from Chicago [illegible] very few in number and unlike [illegible] of the drift or East.

Spirifer [illegible] much thicker and [illegible] out. S. [illegible] of the radiata type. S. Eudora here does not [illegible] the [illegible]. S. radiata [illegible] not the [illegible].

Strophonella semifasciata occurs at Bridgeport. Maybe this form but appears to be much thicker.

Monomorella [illegible] here in [illegible] form.

Arachnophyllum [?] [illegible] looks to me to be different

[illegible] and [illegible] said [illegible] seem here
Evidence [illegible], etc.

"Streptotrichia [illegible]" here. [illegible]
[illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] correct.

[illegible] Unci[illegible] [illegible] the [illegible] of
[illegible] the [illegible],

[illegible] may be [illegible] specimen
[illegible]

[illegible] [illegible] [illegible]
in variety [illegible].

[illegible] by [illegible] [illegible].
All [illegible] the [illegible] [illegible]. It
is simply [illegible] [illegible] [illegible].

[illegible] [illegible] [illegible]. The
[illegible] [illegible] [illegible] [illegible]
[illegible] [illegible]

Sep. 29–1909 Wednesday. Chicago.

Ask Eaton to get me a [illegible] describe the Ptero-dactyl in the Morrison beds. Williston ask this. Dry bone found by Williston.

One of Williston's students this year with Stanton told me that Kiowa shales fossils occur at Lander Wyoming. Williston said that he stated this in print long ago but no one was especially startled [illegible] did not believe it. Stanton surmises that Kootenai may be equivalent of this marine horizon. (Mr. Roberts? I heard his name).

Cambrian occurs in the Wind River Mts.

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2[illegible]1/4

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